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(54) Product wrapping method

(57) A method of wrapping products (2), whereby a sheet (6) and a respective product (2) for wrapping are fed to a wrapping station (4) in a first and second direction (17, 8) incident with each other; the product (2) travels according to a given movement through the wrapping station (4) to engage the sheet (6), upon the sheet (6) reaching a given intercept position, and to feed the sheet (6) in the second direction (8) to form a U-shaped wrapping (31); and the sheet (6) is fed in the first direction (17) through the wrapping station (4) and at most into the intercept position according to any movement as a function of the length of the sheet (6), and subsequently travels according to the same movement as the product (2).

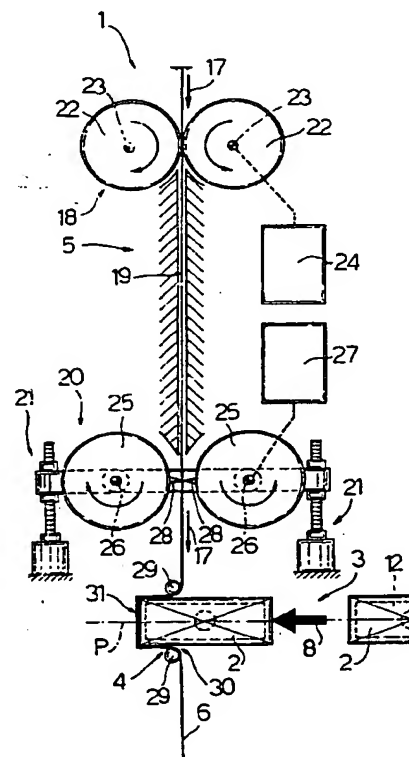


Fig.1

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## Description

The present invention relates to a product wrapping method.

The present invention is especially advantageous for use on continuous overwrapping machines, particularly cellophaning machines for products such as packets or cartons of cigarettes, to which the following description refers purely by way of example.

On overwrapping machines of the aforementioned type, a number of products are fed successively and at constant speed along a supply path to a wrapping station where a respective sheet of synthetic transparent material (normally polypropylene) is folded into a U about each product to be overwrapped.

The product and sheet are normally mated with no difficulty in the case of step-operated overwrapping machines, on which each sheet is usually arrested at the wrapping station until it is mated with the product. Problems arise, on the other hand, when both the sheet and product are fed continuously through the wrapping station, in which case, it is relatively difficult to keep the sheet in the correct position with respect to the product throughout formation of the wrapping.

The same problems are also encountered on step-operated overwrapping machines, if, to increase the output speed of the machine, the sheet is preferably not arrested at the wrapping station.

It is an object of the present invention to provide a wrapping method designed to satisfactorily solve the aforementioned problems.

According to the present invention, there is provided a method of wrapping products; the method comprising the steps of feeding a sheet and a respective product for wrapping to a wrapping station in a first and respectively second direction incident with each other; the product traveling according to a first given movement through the wrapping station to engage the sheet, upon the sheet reaching a given intercept position, and to feed the sheet in the second direction to form a U-shaped wrapping; characterized in that the sheet travels in the first direction through the wrapping station and into at most the intercept position according to a second movement depending on a length of the sheet, and subsequently travels according to said first movement.

According to a preferred embodiment of the above method, said sheet forms an end portion of a continuous strip, and is detached from the strip by means of a cutting operation, which is preferably performed as the sheet and the relative strip travel according to said first movement.

Moreover, said second movement preferably involves feeding said sheet at an average speed greater than, equal to, or less than an average speed of said first movement, depending on whether the length of said sheet is greater than, equal to, or less than the spacing of the products in said second direction.

A non-limiting embodiment of the present invention will be described by way of example with reference to

the accompanying drawings, in which:

Figure 1 shows a side view, with parts in section and parts removed for clarity, of a wrapping machine implementing the method according to the present invention;

Figure 2 shows a plan view, with parts removed for clarity, of a detail of the Figure 1 machine;

Figure 3 shows a side view, with parts in section and parts removed for clarity, of a variation of the Figure 1 machine;

Figure 4 shows a graph relative to operation of the Figure 1 machine.

Number 1 in Figure 1 indicates a wrapping machine for wrapping products 2 comprising, in the example shown, packets or cartons of cigarettes for wrapping in sheets of overwrapping material, in particular, sheets of polypropylene.

Machine 1 comprises a conveyor 3 for feeding products 2 at constant speed along a path P and through a folding or wrapping station 4; and a unit 5 for supplying station 4 with a succession of sheets 6, each for wrapping a respective product 2.

With reference to Figure 2, conveyor 3 comprises two parallel, coplanar conveyor belts 7, which are moved in a direction 8 by a known drive device (not shown), and define a central channel 9 parallel to direction 8.

Each belt 7 comprises a number of equally spaced through holes 10 formed in the thickness of belt 7 and perpendicular to direction 8. Each hole 10 houses in axially-sliding manner a rod 11, the free end of which, inside channel 9, is fitted with a pad 12, the transverse dimensions of which are approximately equal to but no greater than the dimensions of each of two opposite axial end surfaces 13 of product 2. Each rod 11 is coaxial with a corresponding rod 11 on the other belt 7, and both define, together with respective pads 12, a gripping device 14 of a gripping assembly 15 for retaining and feeding a product 2 along path P in direction 8.

The axial position of rods 11 and pads 12 in relation to respective belt 7 is governed by a cam actuating device 16, which forms part of assembly 15 and provides for moving pads 12 forming part of the same gripping device 14 to and from a gripping position in which pads 12 are separated by a distance approximately equal to but no greater than the length of products 2 measured perpendicularly to surfaces 13.

With reference to Figure 1, unit 5 extends from station 4 in a direction 17 perpendicular to direction 8, and comprises an unwinding assembly 18 for feeding a strip 19 of wrapping material towards station 4 in direction 17, and a cutting device 20 located between assembly 18 and station 4, close to conveyor 3, and for cutting strip 19 into a succession of wrapping sheets 6.

The position of cutting device 20 in relation to conveyor 3 may be fixed or, as in the example shown, adjustable by means of a known adjusting device 21 for

moving cutting device 20 in direction 17 and in relation to station 4.

Unwinding assembly 18 comprises a pair of rollers 22 contacting opposite surfaces of strip 19 and mounted for rotation about respective axes 23 perpendicular to the Figure 1 plane and to directions 8 and 17; and a drive unit 24 connected mechanically to rollers 22 and for rotating rollers 22 in opposite directions at an instantaneously adjustable angular speed.

Cutting device 20 comprises a pair of rollers 25 located on either side of strip 19 and mounted for rotation about respective axes 26 parallel to axes 23; and a drive unit 27 connected mechanically to rollers 25 and for rotating rollers 25 in opposite directions at an adjustable, preferably constant angular speed. The peripheral surface of each roller 25 comprises a longitudinal blade 28, and rollers 25 are so synchronized as to bring blades 28 simultaneously into contact with, and so cut, strip 19.

At station 4, unit 5 also comprises a pair of folding rollers 29 mounted for rotation about respective axes parallel to axes 26, and located on either side of path P to define a passage 30 through which products 2 travel.

Operation of machine 1 will now be described with reference to one product 2, and as of the instant in which the leading edge of strip 19 is located at cutting device 20.

Hereinafter, the end portion of strip 19 corresponding to sheet 6 of the product 2 being considered will be referred to as "sheet 6", regardless of whether the sheet has or has not already been detached from the rest of strip 19.

As of the above instant - hereinafter referred to as the "cutting instant" - sheet 6 of the product 2 being considered is generally fed continuously by unwinding assembly 18 in direction 17, through path P and into a position tangent with rollers 29; and product 2 is fed continuously by conveyor 3 towards station 4, and, at a given instant - hereinafter referred to as the "intercept instant" - is positioned with its front surface contacting a portion of sheet 6, which, by the intercept instant, is positioned in what is referred to hereinafter as the "intercept position." Subsequently, product 2, still contacting sheet 6 and moving in direction 8, travels through passage 30 to gradually fold sheet 6 about rollers 29 and gradually form a U-shaped wrapping 31. Normally, as shown in Figure 1, sheet 6 is detached from strip 19 during the formation of wrapping 31.

As regards performance of the above operations, it should be pointed out that product 2 is fed along path P in what, in the example shown, is a constant movement, but which in any case is such as to feed products 2 to station 4 at constant frequency. As a sheet 6 must be formed by cutting device 20 for each product 2 traveling through station 4, device 20 must be so operated that its cutting frequency equals the frequency at which products 2 are supplied to station 4.

As such, for wrappings 31 to be formed properly, which means no slippage whatsoever between sheet 6

and product 2 in the interval between the intercept and cutting instants, conveyor 3, assembly 18 and cutting device 20 must be linked by known electronic axes and control units (not shown) to establish a precise relationship between the movements of product 2 and sheet 6.

Such a relationship is shown by way of example in the Figure 4 space-time graph, which relates to a machine 1 in which:

a) conveyor 3 feeds a product 2 through station 4 at each time interval HK, and imparts to product 2 a precise movement, which, in this case, involves feeding product 2 forward at constant speed;

b) drive unit 24 is so regulated as to supply sheet 6 with the same movement, i.e. at the same constant speed, as product 2 for a period CK, which falls within interval HK, and the length of which, though rightly dependent on the length of sheet 6, is in this case independent of it by being calculated according to the sheet 6 required to wrap the largest product 2 catered to by machine 1;

c) three different cases are considered: the first (curve I) relates to a product 2 of such a size as to require a sheet 6 of length L exactly equal to the spacing of products 2 along path P; the second (curve II) relates to a product 2 of such a size as to require a sheet 6 of length L' shorter than the spacing of products 2 along path P; and the third (curve III) relates to a product 2 of such a size as to require a sheet 6 of length L" greater than the spacing of products 2 along path P;

d) curves I, II and III are drawn relative to a substantially absolute reference system, the origin O of which corresponds, for all three curves, to the instant at which product 2 intercepts sheet 6.

As shown in the Figure 4 graph, each of the three curves comprises a portion AB covered within period CK, and which corresponds to the travel of sheet 6 at constant speed constantly equal to the traveling speed of conveyor 3; and a portion DA covered at generally variable speed.

More specifically, in the case of sheet 6 of length L, portion DA is also covered at constant speed equal to the traveling speed of conveyor 3. In the case of sheet 6 of length L', portion D'A' is covered at an average speed lower than the speed of conveyor 3. In the case of sheet 6 of length L", portion D"A" is covered at an average speed higher than the speed of conveyor 3.

The different locations of cycle start and end points D and B of the three curves correspond to given variations in the timing of cutting device 20 in relation to conveyor 3; which variations are achieved either directly by acting on the angular position of rollers 25, or by moving cutting device 20 in relation to station 4 by means of adjusting device 21.

On machine 1, therefore, any slippage between sheets 6 and products 2 is prevented by so regulating the movement of sheets 6 that it is identical to the move-

ment of respective products 2 between the intercept and cutting instants; and any change in format may be effected substantially in real time by simply varying the timing or position of cutting device 20, and by easily computerized selection of the movement of the sheets during at least part of the time interval in which sheets 6 mate with respective products 2.

The action of blades 28 is preferably, though not necessarily, perfected by so regulating drive unit 27 as to impart to blades 28, at the cutting instant, the same direction and traveling speed as strip 19.

In the Figure 3 variation, cutting device 20 is located close to assembly 18, and unit 5 comprises two known suction belts 32 and 33, the first of which is controlled by a drive unit 34 and is interposed between device 20 and station 4, and the second of which is located downstream from station 4 and is controlled by a drive unit 35. Belt 32 successively receives sheets 6 cut by device 20 and feeds them to station 4, while belt 33 receives the portion of each sheet 6 extending beyond station 4 prior to the intercept instant.

In unit 5 according to the Figure 3 variation, sheet 6 is detached from strip 19 before sheet 6 reaches said intercept position, as opposed to after, as in the case of unit 5 in Figure 1. The movement imparted to belts 32 and 33 by respective drive units 34 and 35 is, however, substantially the same as that of assembly 18.

#### Claims

1. A method of wrapping products (2), the method comprising the steps of feeding a sheet (6) and a respective product (2) for wrapping to a wrapping station (4) in a first (17) and respectively second (8) direction incident with each other; the product (2) traveling according to a first given movement through the wrapping station (4) to engage the sheet (6), upon the sheet (6) reaching a given intercept position, and to feed the sheet (6) in the second direction (8) to form a U-shaped wrapping (31); characterized in that the sheet (6) travels in the first direction (17) through the wrapping station (4) and into at most the intercept position according to a second movement depending on a length of the sheet (6), and subsequently travels according to said first movement.
2. A method as claimed in Claim 1, characterized in that the sheet (6) travels according to said first movement for a period (CK), the length of which depends on the length of the sheet (6).
3. A method as claimed in Claim 1 or 2, characterized in that the sheet (6) travels according to said first movement for a period (CK), the length of which is calculated as a function of a length of a sheet (6) required to wrap a product (2) of maximum size feedable to said wrapping station (4).
4. A method as claimed in one of the foregoing Claims, characterized in that said sheet (6) forms an end portion of a continuous strip (19), and is detached from the strip (19) by means of a cutting operation.
5. A method as claimed in Claim 4, characterized in that said cutting operation is performed as the sheet (6) and the relative strip (19) travel according to said first movement.
6. A method as claimed in Claim 4 or 5, characterized in that the sheet (6) is detached from the strip (19) after the sheet (6) reaches said intercept position.
7. A method as claimed in Claim 4 or 5, characterized in that the sheet (6) is detached from the strip (19) before the sheet (6) reaches said intercept position.
8. A method as claimed in one of the foregoing Claims from 4 to 7, characterized in that said cutting operation is performed at a constant frequency equal to a frequency at which the products (2) are fed through the wrapping station (4).
9. A method as claimed in one of the foregoing Claims from 4 to 8, characterized in that said cutting operation is performed on said sheet (6) at a fixed distance in relation to the wrapping station (4), and is timed, with respect to supply of the products (2) through the wrapping station (4), as a function of the size of the products (2).
10. A method as claimed in one of the foregoing Claims from 4 to 8, characterized in that said cutting operation is performed on said sheet (6) at a distance variable, in relation to the wrapping station (4), as a function of the size of the products (2).
11. A method as claimed in one of the foregoing Claims from 4 to 10, characterized in that said cutting operation is performed by cyclic cutting means (28) moving, at a cutting instant, in said first direction (17).
12. A method as claimed in Claim 11, characterized in that said cutting means (28) travel according to said first movement at the cutting instant.
13. A method as claimed in any one of the foregoing Claims, characterized in that said second movement involves feeding said sheet (6) at an average speed greater than, equal to, or less than an average speed of said first movement, depending on whether the length of said sheet (6) is greater than, equal to, or less than the spacing of the products (2) in said second direction (8).
14. A method as claimed in any one of the foregoing

Claims, characterized in that said first movement involves feeding said products (2) at a constant speed.

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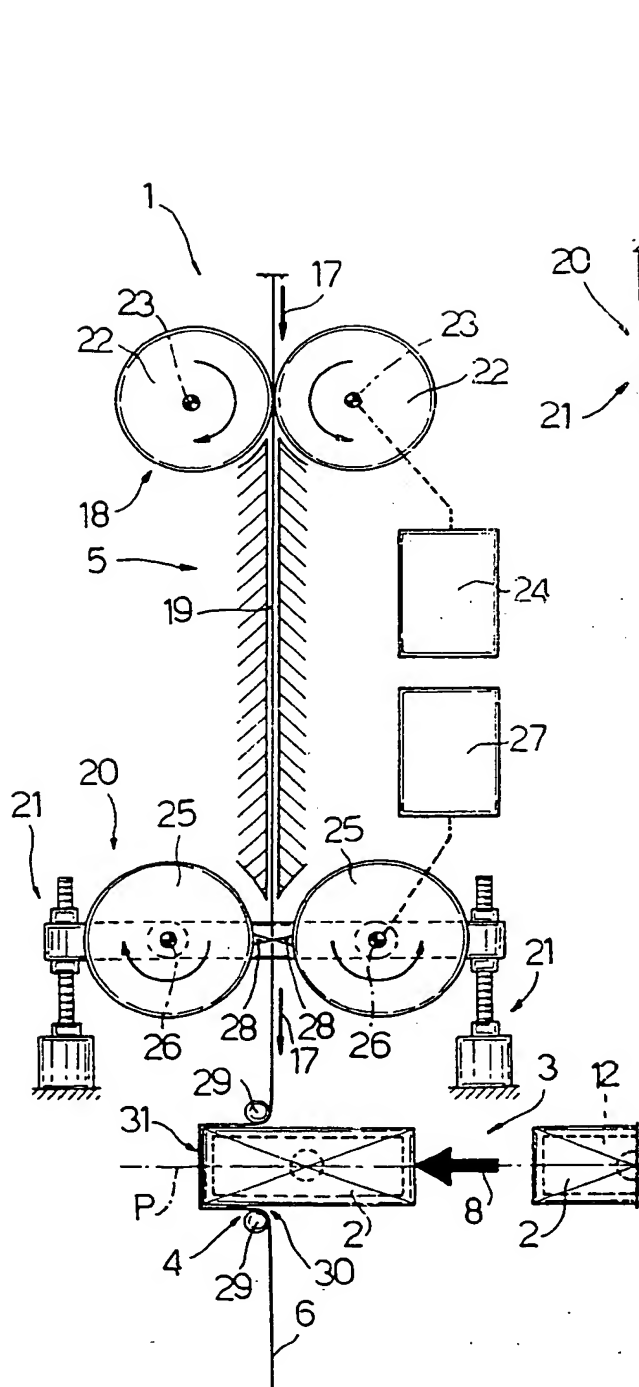


Fig.1

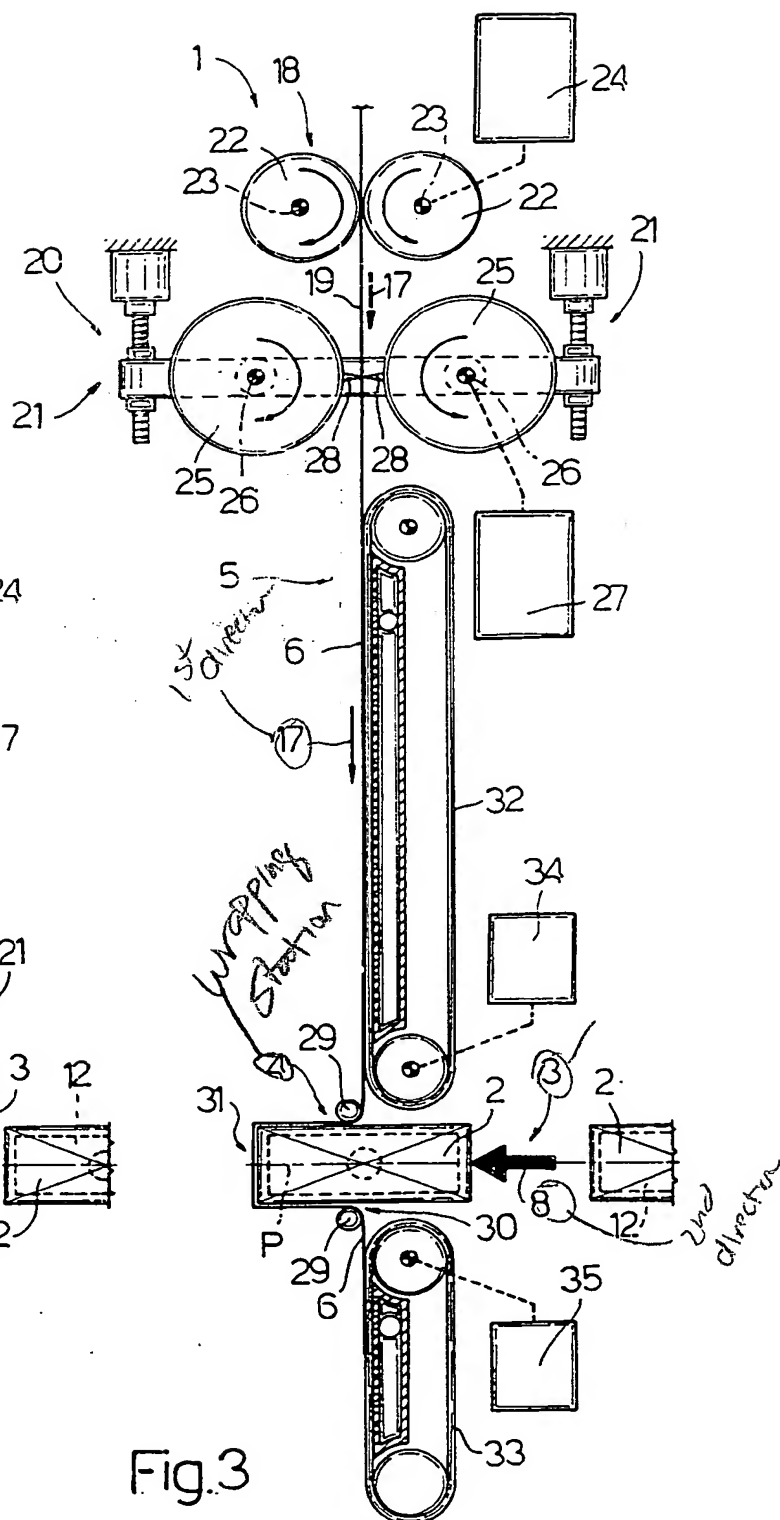


Fig.3

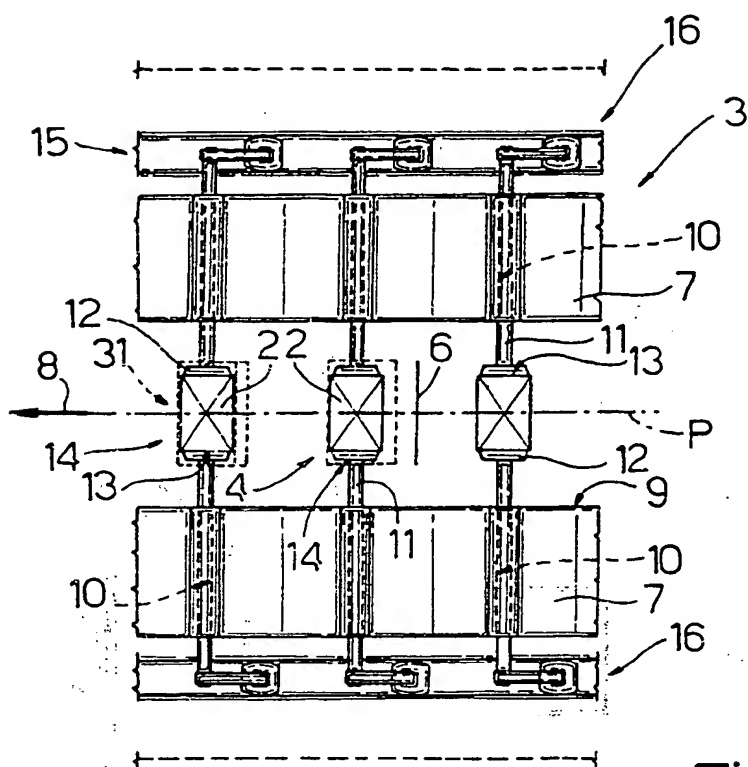


Fig. 2

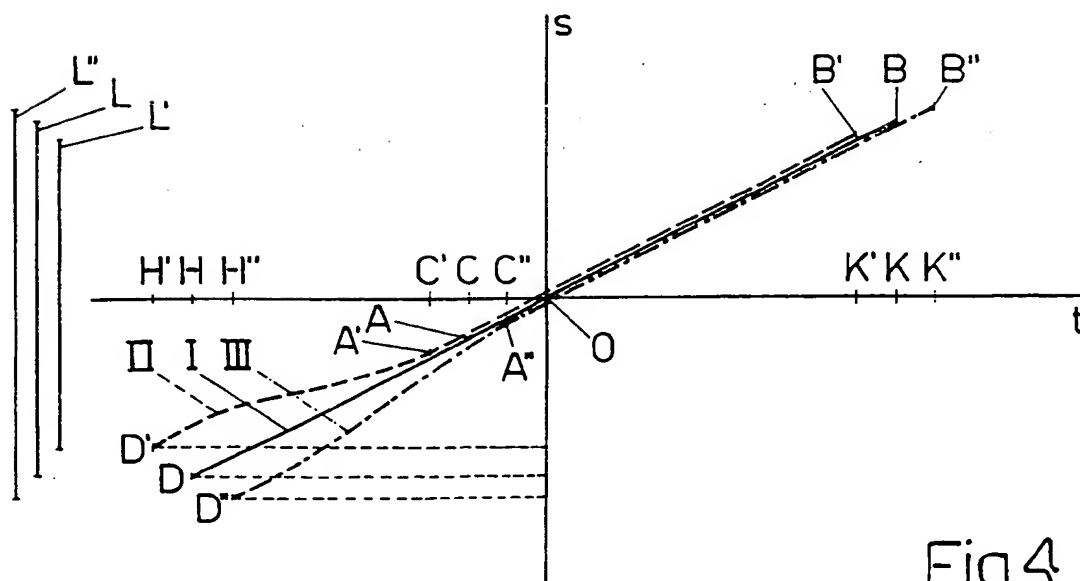


Fig. 4



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## EUROPEAN SEARCH REPORT

Application Number  
EP 97 10 4287

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP 0 443 787 A (MOLINS) * column 5, line 39 - column 8, line 41; figures *	1-5,7-9, 11-14	B65B11/10 B65B19/22
X	GB 2 014 938 A (FUJI PHOTO) * page 2, line 40 - page 3, line 68; figures *	1-6,8,9, 11,12,14	
A	EP 0 532 944 A (A. KREMPEL SÖHNE) * column 5, line 26 - column 6, line 57; figures *	1-3	
A	GB 2 213 456 A (KÖRBER)		
A	DE 35 15 655 A (HAUNI-WERKE KÖRBER)		
A	US 3 507 089 A (A. MIZELLE)		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B65B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 16 June 1997	Examiner Jagusiak, A
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	
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